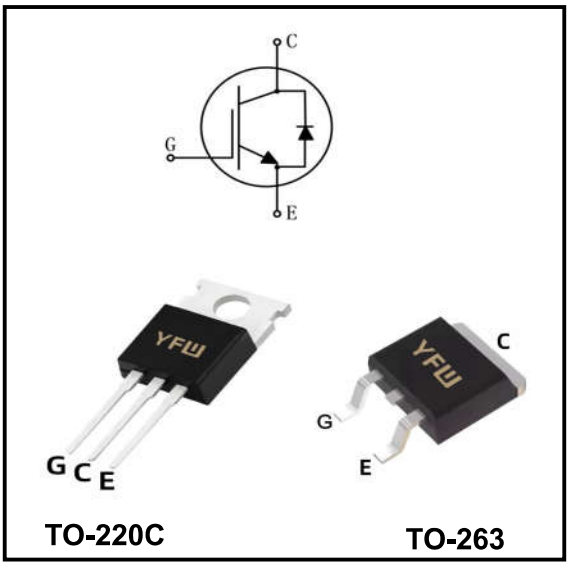
650V N-Channel Enhancement Mode Power IGBT

MAIN CHARACTERISTICS

$I_{C\ @TC=100℃}$	15A
V_{CE}	650V
VCE(sat)-typ	1.6V



TO-220C TO-263

FEATURES

- High ruggedness performance
- 10 μ s short circuit capability
- Positive VCE (sat) temperature coefficient
- High efficiency for motor control
- Excellent current sharing in parallel operation

APPLICATIONS

- Home appliances
- Motor drives
- General inverter

MECHANICAL DATA

- Case: Molded plastic
- Mounting Position: Any
- Molded Plastic: UL Flammability Classification Rating 94V-0
- Lead free in compliance with EU RoHS 2011/65/EU directive
- Solder bath temperature 275℃ maximum,10s per JESD 22-B106

Maximum Ratings

Characteristics	Symbol	Value	Unit
Collector-emitter voltage	V_{CES}	650	V
Gate-emitter voltage	V_{GES}	±20	V
Continuous collector current (TC=25℃)	I_C	30	A
Continuous collector current (TC=100℃)		15	A
Pulsed collector current, tp limited by Tvjmax	I_{CM}	60	A
Diode continuous forward current (TC=100℃)	I_F	15	A
Diode maximum current, tp limited by Tvjmax	I_{FM}	60	A
Power dissipation (TC=25℃)	P_{tot}	150	W
Power dissipation (TC=100℃)		75	W
Operating junction temperature range	T_{vj}	-40 to +175	°C
Storage temperature range	T_{stg}	-55 to +150	°C

Thermal characteristics

Characteristics	Symbol	Values		Unit
		Typ	Max.	
Thermal resistance, junction to case for IGBT	$R_{th(j-c)}$	-	1	K/ W
Thermal resistance, junction to case for Diode	$R_{th(j-c)}$	-	1.5	K/ W
Thermal resistance, junction to ambient	$R_{th(j-a)}$	-	40	K/ W

Note1:Pulse test: 300 μs pulse width, 2 % duty cycle

Electrical characteristics of IGBT at Tvj=25℃ unless otherwise specified

Characteristics	Test Condition	Symbol	Min	Typ	Max	Unit
Collector-emitter breakdown voltage	V_{GE}=0V, I_C=250μA	B_{VCES}	650	-	-	V
Collector-emitter leakage current	V_{CE}=650V, V_{GE}=0V	I_{CES}	-	-	50	μA
Gate leakage current, forward	V_{GE}=±20V, V_{CE}=0V	I_{GES}	-	-	±100	nA
Gate-emitter threshold voltage	V_{GE}=V_{CE}, I_C=1mA	$V_{GE(th)}$	5.4	5.6	5.9	V
Collector-emitter saturation voltage	V_{GE}=15 V, I_C=15A	$V_{CE(sat)}$	-	1.6	1.8	V
	V_{GE}=15V, I_C=15A, T_{vj}=150℃		-	1.9	-	V
Input capacitance	V_{CE}=30V V_{GE}=0V f =1MHz	C_{ies}	-	1055	-	pF
Output capacitance		C_{oes}	-	57	-	pF
Reverse transfer capacitance		C_{res}	-	15	-	pF
Total gate charge	V_{CC}=520V V_{GE}=15V I_C=15A	Q_g	-	55	-	nC
Turn-on delay time	V_{CC}=400V V_{GE}=15V I_C=15A R_G=10Ω Inductive load	td(on)	-	17	-	ns
Rise time		tr	-	14	-	ns
Turn-off delay time		td(off)	-	104	-	ns
Fall time		tf	-	46	-	ns
Turn-on energy		Eon	-	0.3	-	mJ
Turn-off energy		Eoff	-	0.27	-	mJ
Total switching energy		Ets	-	0.57	-	mJ
Turn-on delay time	V_{CC}=400V V_{GE}=15V I_C=15A R_G=10Ω Inductive load Tvj =150℃	td(on)	-	16	-	ns
Rise time		tr	-	15	-	ns
Turn-off delay time		td(off)	-	119	-	ns
Fall time		tf	-	81	-	ns
Turn-on energy		Eon	-	0.38	-	mJ
Turn-off energy		Eoff	-	0.4	-	mJ
Total switching energy		Ets	-	0.78	-	mJ
Diode forward voltage	I_F=15A	VF	-	1.4	1.8	V
	I_F=15A,Tvj=150℃		-	1.2	-	V
Diode reverse recovery time	V_R=400V I_F=15A diF/dt=-600A/μs	trr	-	55	-	ns
Diode peak reverse recovery current		Irrm	-	9.5	-	A
Diode reverse recovery charge		Qrr	-	220	-	nC
Diode reverse recovery time	V_R=400V I_F=15A diF/dt=-600A/μsTvj=150℃	trr	-	75	-	ns
Diode peak reverse recovery current		Irrm	-	15	-	A
Diode reverse recovery charge		Qrr	-	450	-	nC

RATINGS AND CHARACTERISTIC CURVES

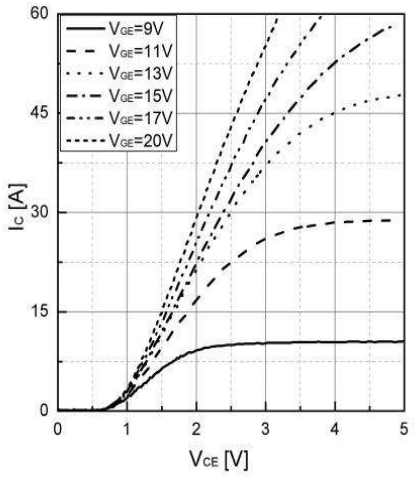


Fig 1. Typical output characteristic (T_{vj}=25℃)

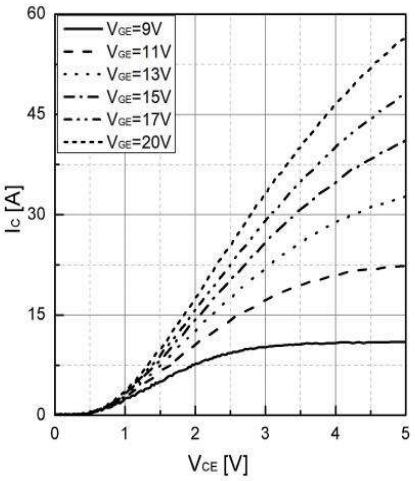


Fig 2. Typical output characteristic(T_{vj}=175℃)

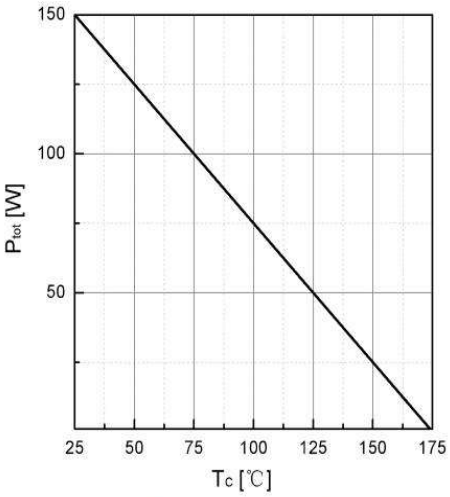


Fig 3. Power dissipation as a function of T_C

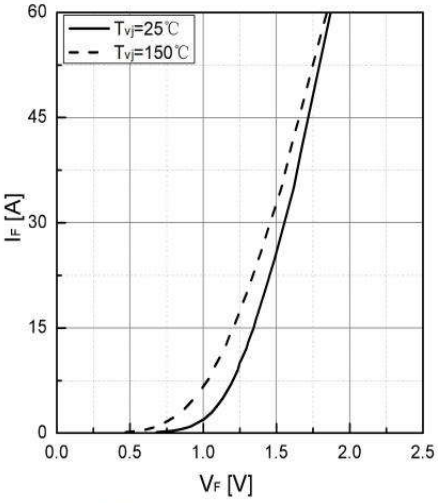


Fig 4. Typical I_F as a function of V_F

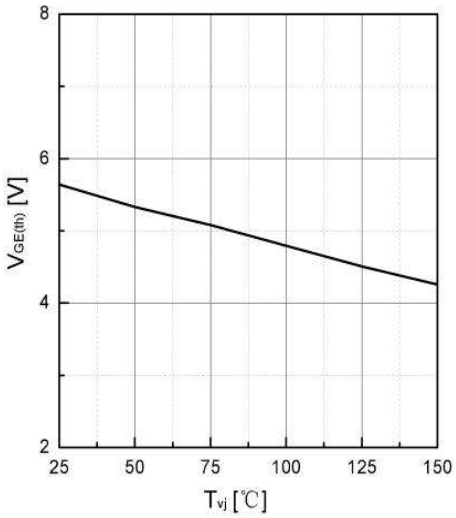


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

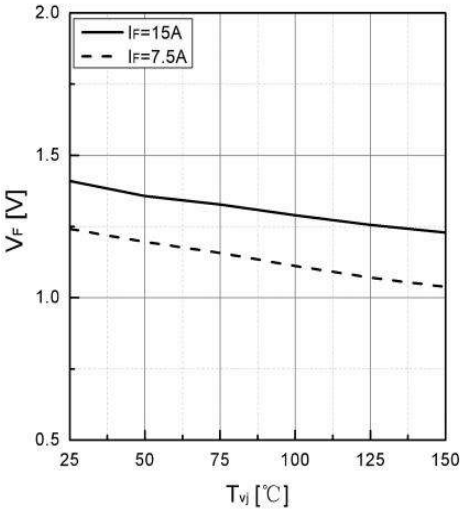


Fig 6. Typical V_F as a function of T_{vj}

RATINGS AND CHARACTERISTIC CURVES

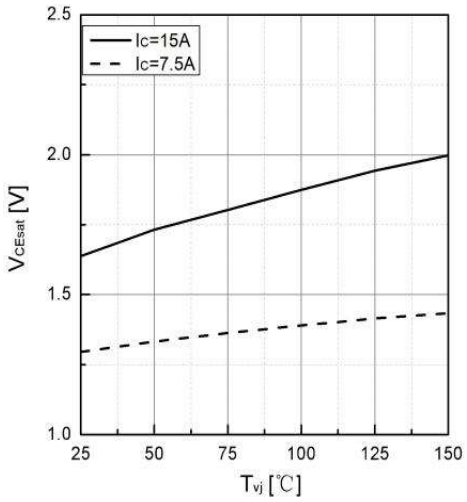


Fig 7. Typical V_{CEsat} as a function of T_{vj}

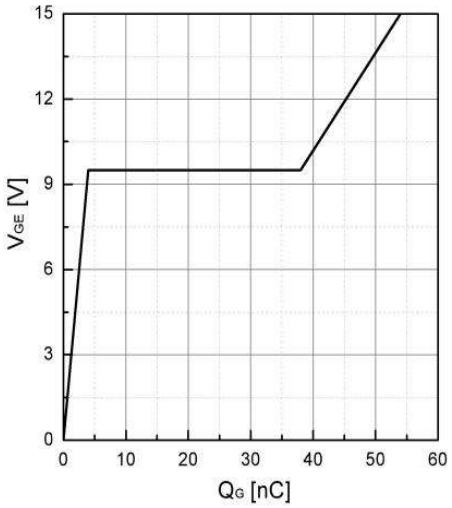


Fig 8. Typical Gate charge

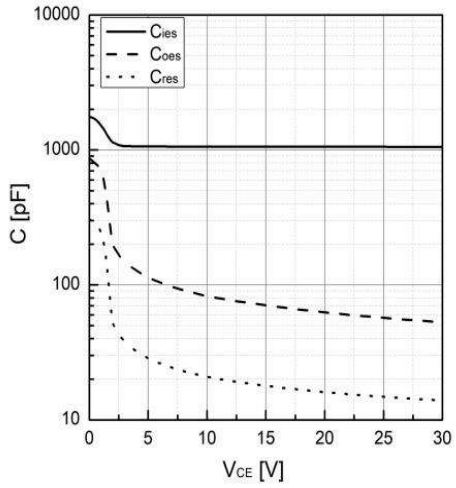


Fig 9. Typical capacitance as a function of V_{CE}
(f=1Mhz, V_{GE}=0V)

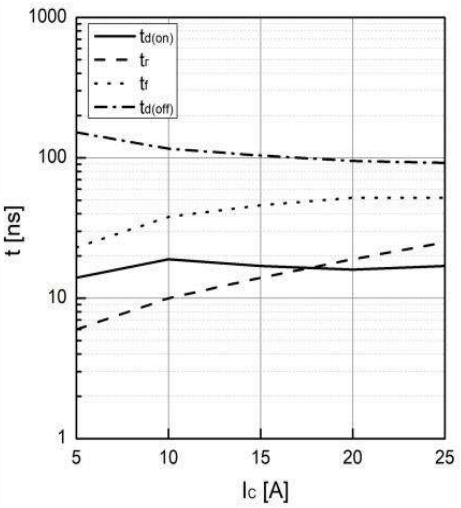


Fig 10. Typical switching times as a function of I_C

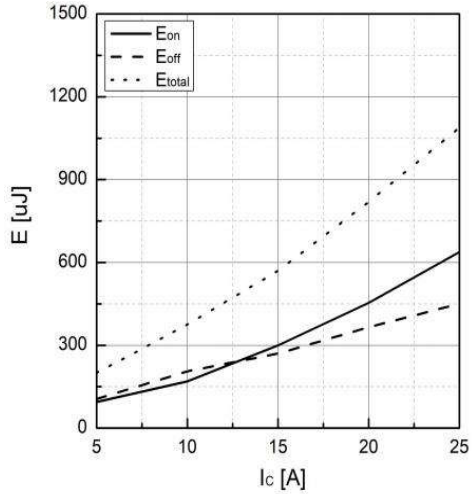


Fig 11. Typical switching energy losses as a function of I_C

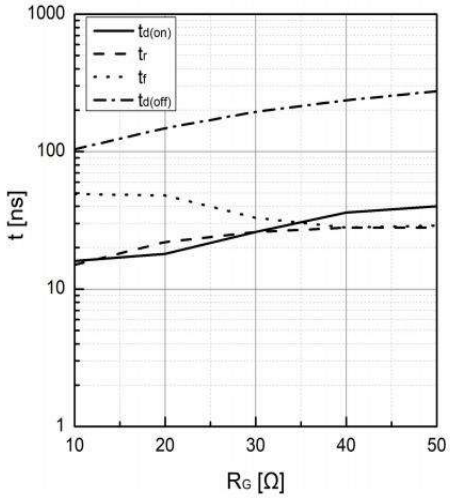


Fig 12. Typical switching times as a function of R_G

RATINGS AND CHARACTERISTIC CURVES

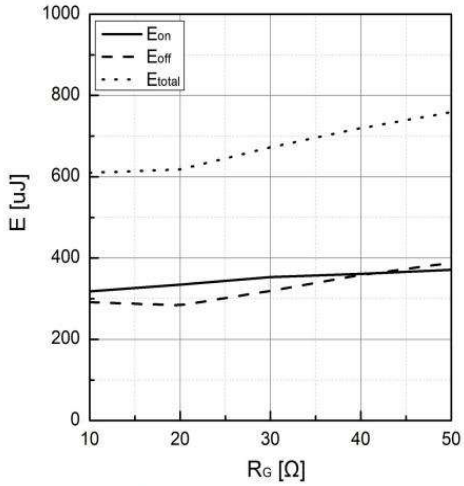


Fig 13. Typical switching energy losses as a function of R_G

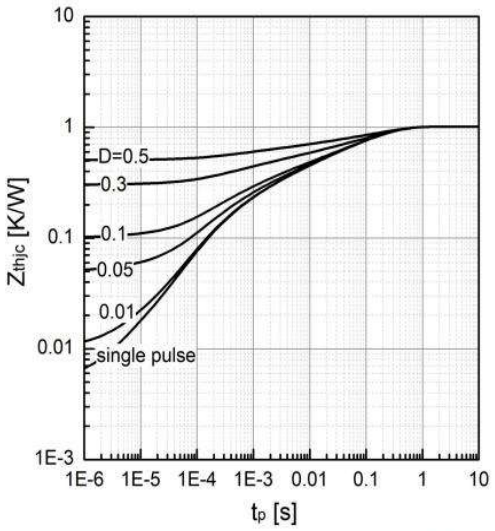
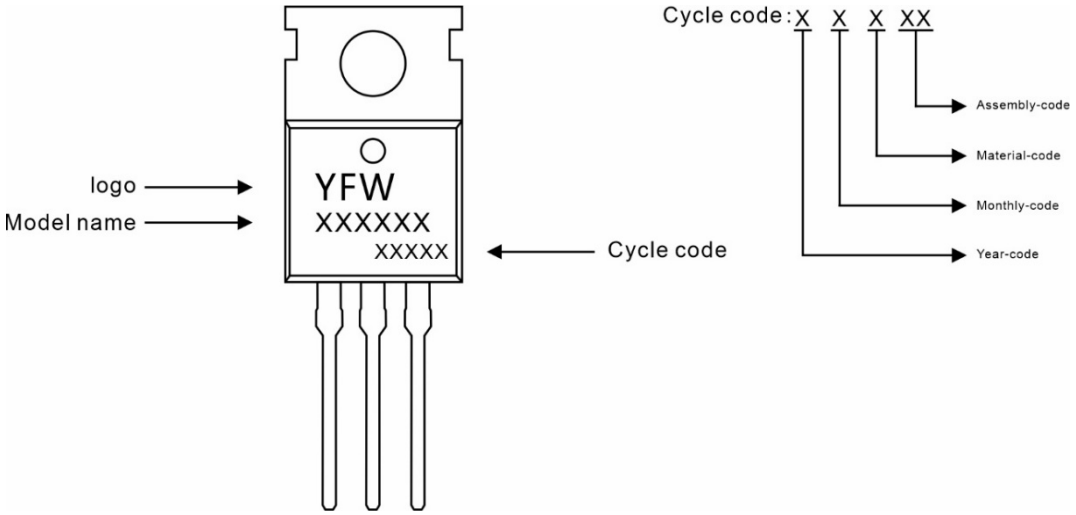


Fig 14. Transient thermal impedance, IGBT

Marking Diagram

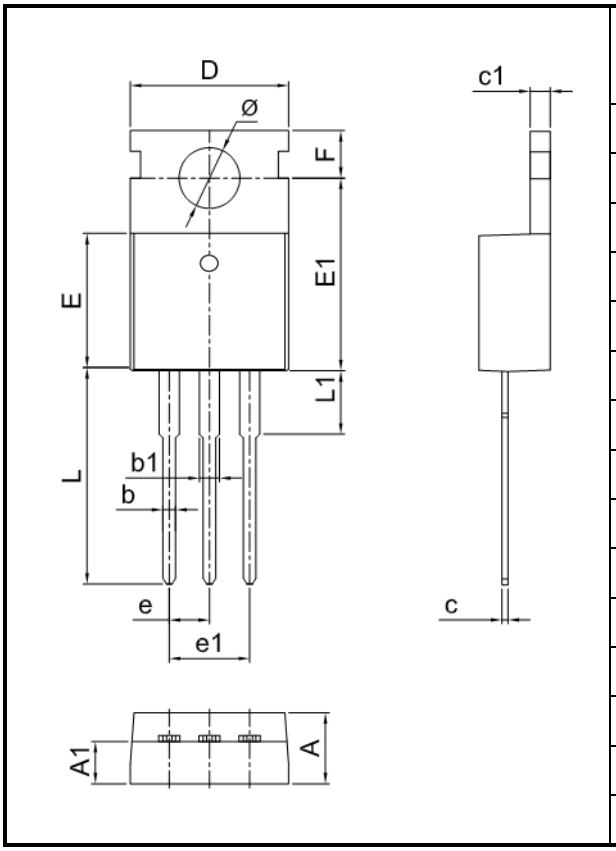


Ordering information

Model name	Package	Unit Weight	Base Quantity	Packing Quantity
YFWG15T65AC	TO-220C	0.07oz(1.96g)	50pcs/tube	1000PCS/Box 5000PCS/Carton

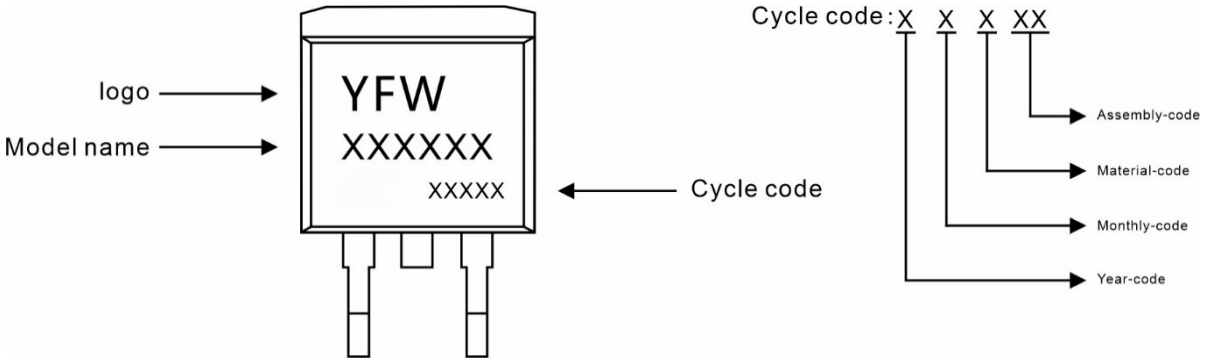
Package Dimensions

TO-220C



Dim	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.34	4.67	0.171	0.184
A1	2.52	2.82	0.099	0.111
b	0.71	0.91	0.028	0.036
b1	1.17	1.37	0.046	0.054
c	0.30	0.50	0.012	0.020
c1	1.17	1.37	0.046	0.054
D	9.90	10.20	0.390	0.402
E	8.50	8.90	0.335	0.350
E1	12.00	12.50	0.472	0.492
e	2.44	2.64	0.096	0.104
e1	4.88	5.28	0.192	0.208
F	2.60	2.80	0.102	0.110
L	13.20	13.80	0.520	0.543
L1	3.80	4.20	0.150	0.165
Φ	3.60	3.96	0.142	0.156

Marking Diagram

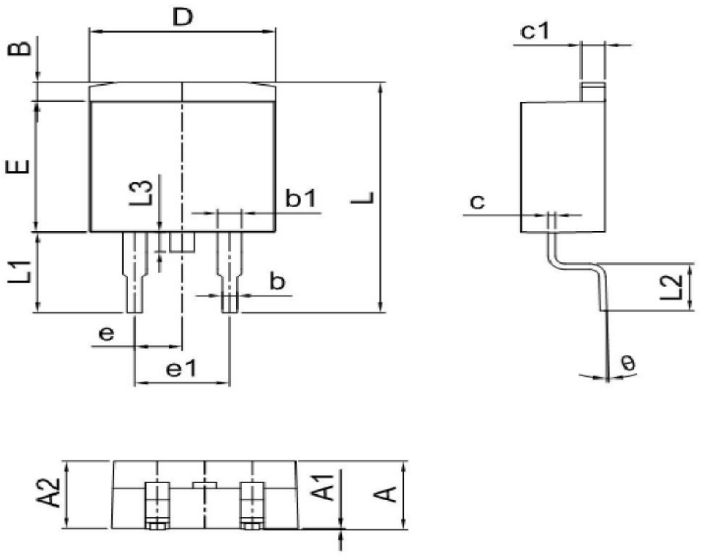


Ordering information

Model name	Package	Unit Weight	Base Quantity	Packing Quantity
YFWG15T65AS	TO-263	0.04oz(1.16g)	800pcs/reel	1600pcs/box 8000pcs/Carton

Package Dimensions

TO-263



Dim	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.30	4.70	0.169	0.185
A1	0.00	0.15	0.000	0.006
A2	4.30	4.55	0.169	0.179
B	1.10	1.50	0.043	0.059
b	0.70	0.90	0.028	0.035
b1	1.20	1.50	0.047	0.059
c	0.30	0.60	0.012	0.024
c1	1.17	1.37	0.046	0.054
D	9.90	10.20	0.390	0.402
E	8.50	8.90	0.335	0.350
e	2.44	2.64	0.096	0.104
e1	4.88	5.28	0.192	0.208
L	15.00	15.30	0.591	0.602
L1	5.20	5.40	0.205	0.213
L2	2.40	2.60	0.094	0.102
L3	1.60	1.80	0.063	0.071

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